US-PAT-NO: 5567444

DOCUMENT-IDENTIFIER: US 5567444 A
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TITLE: Potentiated aqueous ozone cleaning and sanitizing composition for removal of a contaminating soil from a surface

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Abstract Text - ABTX (1):

A cleaning and sanitizing method for soiled solid surfaces, especially clean-in-place process facilities, is described which involves contacting the surfaces first with an aqueous ozone cleaning composition having a pH greater than 7, wherein the ozone is generated by electrical discharge, then quenching the excess ozone and simultaneously sanitizing the surfaces by contact with an aqueous composition containing **hydrogen peroxide,** a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof.

Brief Summary Text - BSTX (2):

The invention relates to an aqueous cleaning and sanitizing composition. The invention also relates to a method for cleaning a soil, from a surface, that can be a tenacious, contaminating residue or film, such as that derived from an organic or food source followed by sanitizing the cleaned surface. More particularly, this invention relates to using either active ozone at a pH greater than 7 or using active ozone potentiated by an additive composition, for the removal of a proteinaceous, fatty or carbohydrate containing soil

residue or film from a solid surface followed by quenching the excess ozone and simultaneously sanitizing the solid surface using an aqueous **hydrogen peroxide** and/or peroxyacid composition.

Brief Summary Text - BSTX (7):
The present invention is based on the discovery that such health hazards and levels of ozone can be minimized and reduced while simultaneously applying further effective sanitizing on the surfaces cleaned by the ozone process. This can be accomplished by application of an aqueous **hydrogen peroxide** and/or peroxyacid composition which effectively quenches the excess ozone present and simultaneously sanitizes the surfaces treated.

Brief Summary Text - BSTX (10):
(b) treating the contacted solid surfaces with an aqueous sanitizing composition comprising an effective amount of **hydrogen peroxide,** a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof sufficient to reduce the oxidation-reduction potential below about +400 mV.

Brief Summary Text - BSTX (13):
(b) circulating an aqueous sanitizing composition comprising an effective amount of **hydrogen peroxide,** a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof sufficient to reduce the oxidation-reduction potential below about +400 mV.

Detailed Description Text - DETX (4):
Typically ozone can be added to an alkaline solution at a pH above 7.5. The aqueous solution can be made alkaline through the addition of a base. Such bases include alkaline metal hydroxides such as sodium hydroxide, potassium

hydroxide, ammonium hydroxide, etc. An alkaline potentiator is a compound that can produce a pH greater than 7 when used in aqueous solution with ozone; or a neutral potentiator can be used at an alkaline pH which can be combined with ozone. These potentiator additives can be used along with, or in place of, the aforementioned hydroxide bases as long as they produce a pH greater than 7. Examples of such materials include alkaline metal carbonates such as sodium carbonate and potassium carbonate or their bicarbonates, and alkaline metal phosphates and alkaline metal silicates such as ortho or polyphosphates and ortho or polysilicates of sodium or potassium. These potentiators can be added as chemical adjuvants to the aqueous medium, or can come from natural sources such as mineral waters. Other examples of potentiators include **hydrogen peroxide,** and short-chain C.sub.3-6 branched alcohols. Typically a pH of 7.5 would be effective for the cleaning effect of the ozonized cleaning solution. Preferably, a pH of higher than 8.0 can be used to lead to a better result. A pH greater than 13.5 is likely not to be effective. Most importantly, an oxidation potential of greater than +550 mV (relative to a Ag/AgCl reference electrode) is needed for cleaning at a pH within the effective range.

Detailed Description Text - DETX (22):

In use the aqueous materials are typically contacted with soiled target surfaces. Such surfaces can be found on exposed environmental surfaces such as tables, floors, walls, can be found on ware including pots, pans, knives, forks, spoons, plates, dishes, food preparation equipment; tanks, vats, lines, pumps, hoses, and other process equipment. One preferred application of the materials of the invention relates to dairy processing

equipment. Such equipment are commonly made from glass or stainless steel. Such equipment can be found both in dairy farm installations and in dairy plant installations for the processing of **milk,** cheese, ice cream or other dairy products.

Detailed Description Text - DETX (26):
The cleaned coupons were then immersed in cold (40.degree. F.) **milk while the milk** level was lowered at a rate of 4 feet per hour by draining the **milk** from the bottom. The coupons were then washed in a consumer dishwasher under the following conditions:

Detailed Description Text - DETX (41):
Following the ozone cleaning step, the excess ozone can be quenched rapidly by injection of quenchers into the liquid stream prior to the spray into the liquid stream. The present invention applies onto the ozone cleaned surfaces a composition which not only quenches the ozone but simultaneously acts as a sanitizer. Thus, the second step is the contact of the cleaned surfaces or clean in-place process facilities with an aqueous sanitizing composition comprising an effective amount of **hydrogen peroxide,** peroxyacid, namely a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof. This application allows the ozonated aqueous solutions to clean proteinaceous soils in clean-in-place systems, followed by a deactivation step where ozone is rapidly removed and simultaneous sanitizing occurs.

Detailed Description Text - DETX (42):
Thus, the application of **hydrogen peroxide,** a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof affords not only

surprising effective quenching of ozone but simultaneous sanitizing of the solid surfaces.

Detailed Description Text - DETX (46):
Thus, a preferred composition may contain a combination of approximately about 10-150 ppm of a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic acid, about 0-25 ppm of octanoic acid, and about 2-200 ppm of **hydrogen peroxide**.

Detailed Description Text - DETX (49):
The peracid components used in the composition of the invention can be produced in a simple manner by mixing a **hydrogen peroxide** (H.sub.2 O.sub.2) solution with the desired amount of acid. With the higher molecular weight fatty acids, a hydrotrope coupler may be required to help solubilize the fatty acid. The H.sub.2 O.sub.2 solution also can be added to previously made peracids such as peracetic acid or various perfatty acids to produce the peracid composition. The concentrate can contain about 1 to 70 wt-%, preferably about 5 to 30 wt-% of **hydrogen peroxide**.

Detailed Description Text - DETX (50):
The concentrate composition can further comprise a free C.sub.1 -C.sub.10 carboxylic acid, or mixtures thereof as mentioned above. The free C.sub.1 -C.sub.10 carboxylic acid can be present as a result of an equilibrium reaction with the **hydrogen peroxide** to form the peroxyacids.

Detailed Description Text - DETX (60):
The composition of the invention can be made by combining by simple mixing of **hydrogen peroxide** and an effective amount of a C.sub.1 -C.sub.10 peroxyacid. A preferred composition of the invention can be made by

mixing a C.sub.1
-C.sub.10 carboxylic acid, a coupler and a stabilizer and
reacting this mixture
with **hydrogen peroxide**. A stable equilibrium mixture is
produced containing a
C.sub.1 -C.sub.10 peroxycarboxylic acid allowing the mixture
to stand for from
one to seven days at 15.degree. C. to 25.degree. C. As with
any aqueous
reaction of **hydrogen peroxide** with a free carboxylic acid,
this gives a true
equilibrium mixture. In this case, the equilibrium mixture
will contain
hydrogen peroxide, a C.sub.1 -C.sub.10 carboxylic acid, a
C.sub.1 -C.sub.10
peroxycarboxylic acid, water, and various couplers and
stabilizers.

Detailed Description Text - DETX (61):
By using the above approach, the composition of the
invention can be
formulated by merely mixing readily available raw materials,
e.g., acetic acid,
hydrogen peroxide and fatty acid. By allowing solution time
for equilibrium to
be obtained, the product containing both of the active
biocides is obtained.

Detailed Description Text - DETX (63):
The present invention contemplates a concentrate
composition which is
diluted to a use solution prior to its utilization as a
sanitizer and dependent
upon the intended dilution factor and desired acidity in the
use solution. The
C.sub.1 -C.sub.10 peroxyacid component is generally obtained
by reacting a
C.sub.1 -C.sub.10 carboxylic acid with **hydrogen peroxide**.
The resulting
concentrate is diluted with water to provide the use
solution. Generally, a
dilution of 1 fluid oz. to 4 gallons (i.e. dilution of 1 to
500 by volume) or
to 8 gallons (i.e. dilution of 1 to 1,000 by volume) of water
can be obtained
with 2% to 20% total peracids in the concentrate. Higher use

dilution can be
employed if elevated use temperature (greater than 20.degree. C.) or extended
exposure time (greater than 30 seconds) are also employed.

Detailed Description Text - DETX (64):
In its intended end use, the concentrate is diluted with a major proportion of water and used for purposes of sanitization. The typical concentrate composition described above is diluted with available tap or service water to a formulation of approximately 1 oz. concentrate to 8 gallons of water. An aqueous antimicrobial sanitizing use solution comprises at least about C.sub.1 -C.sub.10 ppm, preferably about 20 to 50 ppm of a C.sub.1 -C.sub.8 peroxycarboxylic acid, and at least about 1 ppm, preferably about 2 to 200 ppm of **hydrogen peroxide**. Preferably the total peracid concentration in the use solution is less than about 75 ppm, and most preferably between about 5 to 50 ppm. Higher levels of peracids can be employed in the use solution to obtain disinfecting or sterilizing results.

Detailed Description Text - DETX (103):
FIG. 4 illustrates the ozone quenching effect of using common peroxygen bleaches**--hydrogen peroxide** and sodium percarbonate--on ozone-cleaning systems. The data demonstrates the effectiveness of these adjuvents to likewise destroy ozone; however, it is known that the tested concentrations of peroxygen bleaches will not render significant microbial control. The data is significant since it is most common to prepare, in-situ, and employ the aforementioned peracid sanitizers with **hydrogen peroxide**. Consequently this allows for the **hydrogen peroxide,** usually present in large excess vs. the peracid, to rapidly catalyze and destroy the ozone-cleaner

without significant
loss in the peracid; thus allowing for simultaneous sanitizing and quenching.

Claims Text - CLTX (3):
(b) treating the contacted solid surface with an aqueous sanitizing
composition comprising an effective amount of a **hydrogen peroxide,** C.sub.1
-C.sub.10 peroxyaliphatic carboxylic acid or a mixture thereof sufficient to
reduce the oxidation-reduction potential below about +400 mV.

Claims Text - CLTX (12):
10. The method of claim 5, wherein the aqueous sanitizing composition
comprises at least about 1 ppm of **hydrogen peroxide**.

Claims Text - CLTX (16):
(c) about 2 to 200 ppm of **hydrogen peroxide**.

Claims Text - CLTX (20):
(b) circulating an aqueous sanitizing composition comprising an effective
amount of **hydrogen peroxide,** a C.sub.1 -C.sub.10 peroxyaliphatic carboxylic
acid or a mixture thereof sufficient to reduce the oxidation-reduction
potential below about +400 mV.

Claims Text - CLTX (29):
22. The method of claim 17, wherein the aqueous sanitizing composition
comprises at least about 1 ppm of **hydrogen peroxide**.

Claims Text - CLTX (33):
(c) about 2 to 200 ppm of **hydrogen peroxide**.

Claims Text - CLTX (35):
25. The method of claim 13, wherein the process facilities comprise a **milk**

line dairy.

Current US Cross Reference Classification - CCXR (2):
134/22.13